

EasyNarrator  
EasyPreacher  
EasyBabbler  
EasyChatter  
EasyOrator

EasyTalker™ O.K.  
EasyRanter  
EasyTattler  
EasyReciter  
EasyRhetor  
EasySpeaker

USER'S manual

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EasyFlexion circuit is patent pending in major countries of the world.

Data on allophones reprinted with permission of General Instrument Corporation.

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Robotron Pty.Ltd., PO Box 232,  
Mooroolbark 3138, Australia

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# I. INTRODUCTION

## 1. What Is EasyTalker?

EasyTalker is an advanced speech synthesizer. Advanced because its speech is crisp and clear as never possible before. Advanced because it implements EasyFlexion, a unique method of introducing natural-sounding inflection into computer speech.

Being also compatible with all computers which have a serial interface (and there are not many which have not!), being good-looking and yet inexpensive - all this makes the little Australian-made EasyTalker Number One in the world!

## 2. What Is EasyFlexion?

EasyFlexion is the only method which makes speech inflection feasible for computer speech synthesis. It is a result of long term research into acoustical properties of human speech, conducted in Robotron's laboratories. EasyFlexion is a simple yet most effective solution to the old inflection problem: it models the natural inflection of average human speech, its pitch levels and the pitch

'slope'.

EasyFlexion is controlled by only three commands which cause the inflection level to go 'low', 'medium' or 'high'. The natural 'slope' or rate with which the inflection 'slides' is controlled automatically, in a way fully transparent to the user.

Indeed, the use of EasyFlexion could not have been made simpler. And yet, the effect is astonishing: hear EasyTalker say 'hello' upon being switched on and you'll understand what we mean.

## 3. Is EasyTalker Useful?

Although the low price of EasyTalker justifies its purchase merely as a toy which can become the centre of entertainment at your next home party, its scope is far greater.

Businesses will certainly appreciate oral product demonstrations. The life of the blind and handicapped can be made much easier with a computer and EasyTalker. The industry already uses EasyTalker for spoken data transmission. Flashing red lights for alarms on instruments and machines are being replaced by EasyTalker speech.

School children can receive spoken computer instruction as well as spoken drills and testing.

Only sky and your imagination is the limit of the usefulness of EasyTalker. Write to us about how you use it. We also welcome any suggestions of how the product can be further developed and improved.

## II.USING EASYTALKER

### 1. Interfacing EasyTalker to your computer

EasyTalker uses the standard serial interface, known as RS-232C. Most personal and business computers on the market support this interface, mainly for connecting the computer to a printer or a modem. That's why interfacing EasyTalker is so easy: simply plug the RS-232 cable to the EasyTalker socket. Then, to make EasyTalker talk, use the commands which you normally use to direct data from your computer to the printer or modem. (E.g. in most computers the corresponding Basic command is LPRINT.)

Some toy computers do not have serial interface as standard, but rather as an optional card or cartridge to be purchased separa-

ly. It may also be necessary to 'redirect' standard data output to the plugged-in card or cartridge. (E.g. in Commodore 64 or VIC-20 using the OPEN command, etc.) The correct procedure when using the add-on serial interface is described in the programmer's reference guide of your computer or the user's manual of your serial interface.

For technical details on the serial interface as used in EasyTalker, please refer to chapter IX, Technical Specifications.

### 2. EasyTalker Commands

EasyTalker does not have many commands. In fact, it was our intention to use as few commands as possible but to make them sufficiently powerful for EasyTalker to be simple to operate.

The list of all commands is on the following page. A more detailed description is in the paragraphs following.

command	brief description
!V#	Set volume, where # is a number in the range 0 - 7. (0 is minimum volume, 7 is maximum.)
!A	Allophone mode. (The subsequent characters are interpreted as allophones until terminated by a space character or carriage return.)
!L	EasyFlexion low. (Voice pitch goes to the low level.)
!M	EasyFlexion medium. (Voice pitch goes to the medium level.)
!H	EasyFlexion high. (Voice pitch goes to the high level.)
!LAUGH !GIGGLE !CHUCKLE !TITTER	Various types of laughter.

From the previous list it is obvious that every command is denoted by an exclamation mark. Therefore if EasyTalker encounters an exclamation mark in your text, immediately followed by a character, it searches first its command table. If the command is found to be valid, it is executed immediately. Otherwise the exclamation mark is considered to indicate an end of a sentence. To avoid misinterpretation, it is recommended that sentences should be separated by a space character, e.g.:

"Hello! How are you?"  
rather than  
"Hello!How are you?"

### 3. Getting Started

Plug the 9V DC power pack into your power outlet, then plug the power pack connector into the socket at rear of EasyTalker. The red light should come on and EasyTalker should say 'hello'.

Connect your computer RS-232 interface to EasyTalker, using an RS-232 cable. Make sure your interface is set properly to EasyTalker baud rate and character format (for details refer to chapter IX, Technical Specifications).

Now send any message from your computer to EasyTalker. You should hear the message pronounced. If there is no response, please check the setting of your RS-232 interface.

You can use EasyTalker even without knowing anything about its commands and rules of pronunciation. However, to be able to make most of it, we recommend that you read the following pages first.

### III.TEXT-TO-SPEECH CONVERSION MODE

#### 1.Conversion Rules

Upon power on and also at the beginning of every new line (i.e. upon a carriage return), EasyTalker sets itself automatically into text-to-speech conversion mode. In practice it means that any English text you send to EasyTalker will be pronounced word-by-word using the inbuilt text-to-speech conversion algorithm. The actual pronunciation starts when the data output from the computer is terminated by a carriage return.

The text-to-speech algorithm contains around 400 rules of translation of written text into

English speech. Apart from the rules, there is also a large table of exceptions. The algorithm is very efficient and guarantees proper pronunciation of at least 95% of English words in common usage. Less common words and unusual names may sometimes need an adjustment in spelling to help EasyTalker to pronounce them correctly. However, this sort of adjustment is usually very easy and straightforward. There is no word which EasyTalker cannot pronounce.

An important tool for improving pronunciation is the hyphen. Note how it improves the pronunciation of the word 'moreover': more-over. Also notice the effect of an inserted hyphen upon some correctly pronounced words like 'coke': co-ke.

The spelling of some English words is ambiguous: the pronunciation sometimes depends on their meaning in the context. For example, the word 'wind' is normally pronounced as a verb meaning 'to turn'. To have the word pronounced with the meaning of 'a current of air', use a different spelling: 'wynd'.

On top of the ordinary text-to-speech conversion rules, Easy-

Talker contains some special ones, concerning some abbreviations and mathematical symbols.

Amongst some of the less obvious symbols and abbreviations are:

Mr, Mrs, Mc, Dr correctly pronounced as 'mister', etc.

\$ 'dollars'

% 'percent'

& 'and'

( 'open bracket'

) 'close bracket'

\* 'times'

+ 'plus'

- 'minus' if the second character following is NOT a letter, otherwise no sound (a hyphen)

# 'number'

" 'quote'

. 'point' if the following character is a digit, otherwise no sound

/ 'over'

: 'colon'

; 'semicolon'

< 'less than'

> 'greater than'

= 'equals'

@ 'at'  
^ 'power'

Diacritics not listed above are disregarded, with the exception of '!' and '?', which serve to denote automatic inflection of sentences.

Lower case and upper case characters are treated the same in text-to-speech conversion mode.

Single letters of alphabet are spelled rather than pronounced.

Contracted forms such as I'm, she's, etc. are pronounced correctly.

Digits are combined to groups of five and pronounced as a single number except where they immediately follow a decimal point, where they are sounded individually. Leading zeros are disregarded.

For data logging in industry, a special set of recognized abbreviations has been added to cater for use with the Solartron Orion data logger:

vdc	'volts DC'
vac	'volts AC'
maa	'milliamps AC'
dgc	'degrees Celsius'

## 2. Setting Volume

In the text-to-speech conversion mode, EasyTalker allows setting a different volume for every word in the text. There are eight levels of volume. The volume can be set using the !V# command, where # is a number in the range 0 - 7, indicating the volume level required.

Example 1:

```
!V0 hello
```

The word 'hello' is pronounced in EasyTalker's softest level.

Example 2:

```
!V7 Peter !V4 come here.
```

The name 'Peter' is pronounced at the maximum volume level. The remaining words of the sentence are pronounced at a medium level.

Note: Upon power on, the volume is set automatically at level 5.

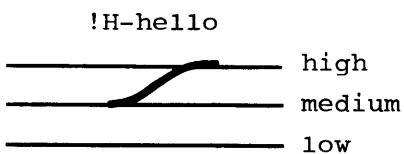
## 3. Using EasyFlexion

Upon power on and also at the beginning of each new line (i.e. after each carriage return), the inflection is set at the medium level.

Using the commands !L and !H, you can swing the inflection to the lower or higher pitch level, respectively. The command !M returns the voice pitch back to the medium level.

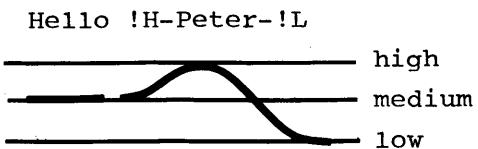
In text-to-speech conversion mode, the EasyFlexion commands can be used for inflection of whole words, in the same manner as the !V command. They must be placed before or after whole words.

Example 1:

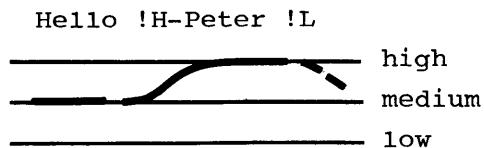


Note that there is a difference when an EasyFlexion command is appended immediately after a word rather than after a space character following the word:

Example 2:



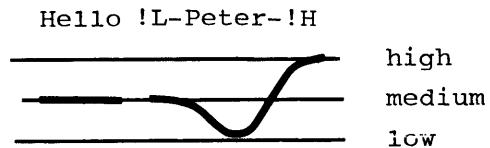
Example 3:



In Example 2, the final syllable of 'Peter' will be still sounding when the !L command is executed. This means that the final part of this word will be inflexed 'low'. In the next example, however, the word 'Peter' won't be affected by the subsequent !L command at all.

The following example is a reversal of the Example 2:

Example 4:



Try examples 2 and 4 again, successively, and note the difference.

This unique property of EasyFlexion, the ability to influence previous syllables as well as the following ones, is most important. Indeed, it is the prime factor which enables inflection to be implemented so easily.

Note: In the previous examples, hyphens were used to separate EasyFlexion commands from words, for greater readability. However, this is not compulsory, i.e.

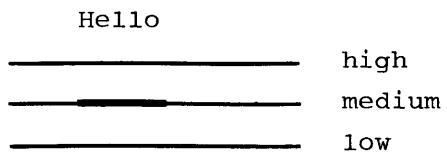
Hello !HPeter!L  
is also acceptable.

## 4. Automatic Inflection of sentences

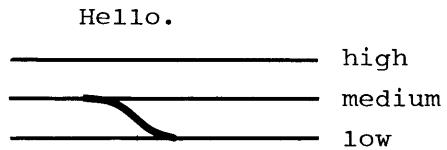
If a phrase is terminated with a dot or an exclamation mark then it is supposed to be affirmative and the voice pitch at the end of the sentence will be lowered.

A question mark at the end of a sentence causes the voice pitch to go 'high', assuming the phrase to be interrogative.

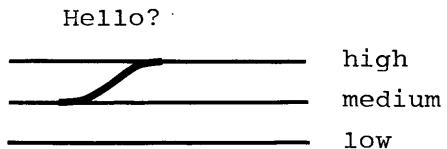
### Example 1:



### Example 2:



### Example 3:



## IV. ALLOPHONE MODE

### 1. Speaking Allophones

Allophones are individual speech sounds. EasyTalker creates its speech by joining allophones together - that's why its vocabulary is unlimited. The allophone set of EasyTalker contains 59 speech sounds, as commonly found in English language, and 5 unvoiced pauses of different length.

The quality of speech generated by joining allophones depends very much on the manner in which the allophones are treated. It is an art and science in itself. In the text-to-speech conversion mode, EasyTalker does all the job of joining allophones automatically - you can generate speech without actually knowing what is going on in the process.

However, the reason why we included the allophone mode here is to enable you to make most of EasyTalker. Using the allophone mode together with EasyFlexion, you can generate speech of unmatched quality. It is possible to give a real personality to the generated speech. For example, the characteristic 'hello' you hear when you turn EasyTalker on is different (and we believe it is nicer) from that which you receive by sending 'hello' to EasyTalker in the text-to-speech conversion mode. It is because the power-on 'hello' was created using the allophone mode.

## 2. What are allophones, anyway?

You may have already heard the word 'phoneme' - which is the name given to a group of similar sounds in a language. However, phonemes are acoustically different depending upon their position within a word. For this reason, and also because there is no one-to-one correspondence between written letters and speech sounds, we must have allophones to provide a good quality speech.

An allophone is a positional variant of the same phoneme. (For instance, the initial sound 'p' in 'pop' is different from the final one.) That's why you find as many as three variants of certain phonemes in the EasyTalker allophone set, making EasyTalker speech superior to that of its competitors.

## 3. Allophone Inventory

The complete allophone set is shown in the following tables, together with guidelines of how to use allophones in words.

### a/ Silence

- PA1 10ms, before BB, DD, GG and JH
- PA2 30ms, before BB, DD, GG and JH
- PA3 50ms, before PP, TT, KK and CH  
also between words
- PA4 100ms, between sentences
- PA5 200ms, between sentences

### b/ Short vowels

- \*IH sitting, stranded
- \*EH extent, gentlemen
- \*AE extract, acting
- \*UH cookie, full
- \*AO talking, song
- \*AX lapel, instruct
- \*AA pottery, cotton

### c/ Long vowels

- IY treat, people, penny
- EY great, statement, tray
- AY kite, sky, mighty
- OY noise, toy, voice
- UW1 after clusters with YY:  
computer
- UW2 in monosyllabic words:  
two, food
- OW zone, close, snow
- AW sound, mouse, down

#### d/ R-colored vowels

ER1 letter, furniture, interrupt

ER2 monosyllables: bird, fern,  
burn

OR fortune, adorn, store

AR farm, alarm, garment

YR hear, earring, irresponsible

XR hair, declare, stare

#### e/ Resonants

WW we, warrant, linguist

RR1 initial position: read, write

RR2 initial clusters: brown,  
crane, grease

LL like, hello, steel

EL little, angle, gentlemen

YY1 clusters: cute, beauty,  
computer

YY2 initial position: yes, yarn

#### f/ Voiced fricatives

VV vest, prove, even

DH1 initial position: this, then

DH2 final and between vowels:  
bathe, bathing

ZZ zoo, phase

ZH beige, pleasure

#### g/ Voiceless fricatives

\*FF      } These may be doubled for  
\*TH      } initial position and used  
\*SS      } singly in final position.

SH shirt, leash, nation

HH1 before front vowels: YR, IY, IH,  
EY, EH, XR, AE

HH2 before back vowels: UW, UH, OW,  
OY, AO, OR, AR

WH white, whim, twenty

#### h/ Voiced stops

BB1 final position: rib  
between vowels: fibber

in clusters: bleed, brown

BB2 initial position before a  
vowel: beast

DD1 final position: played, end

DD2 initial position: down  
clusters: drain

GG1 before high front vowels: YR,  
IY, IH, EY, EH, XR

GG2 before high back vowels: UW,  
UH, OW, OY, AX

clusters: green, glue

GG3 before low vowels: AE, AW, AY,  
AR, AA, AO, OR, ER

in medial clusters: anger

in final position: peg

i/ Voiceless stops

PP pleasure, ample, trip

TT1 final clusters before SS:

tests, its

TT2 all other positions: test,  
street

KK1 before front vowels: YR, IY, IH,  
EY, EH, XR, AY, AE, ER, AX

initial clusters: cute, clown,  
scream

KK2 final position: speak  
final clusters: task

KK3 before back vowels: UW, UH, OW,  
OY, OR, AR, AO  
initial clusters: crane,  
quick, clown, scream

j/ Affricates

CH church, feature

JH judge, injure

k/ Nasal

MM milk, alarm, ample

NN1 before front and central

vowels: YR, IY, IH, EY, EH, XR, AE,  
ER, AX, AW, AY, UW

final clusters: earn

NN2 before back vowels: UH, OW, OY,  
OR, AR, AA

NG string, anger

As has been mentioned before, the previous tables also contain five types of pause of various durations (PA1 - PA5). They can be used to separate words (PA3) and sentences (PA4, PA5), and to improve pronunciation of some consonants (PA1, PA2).

Note also that the allophone set contains two or three versions of certain phonemes, e.g. KK1, KK2, KK3, to be used in different positions in the word or in different combinations with other allophones.

The allophones marked with an asterisk may be doubled. Doubling of some consonants is often useful at the beginning of a word, as in the word 'sister':

SS-SS-IH-SS-TT2-ER1.

Vowels may be doubled to make longer versions of stressed syllables - for example in the word 'extent':

EH-KK1-SS-TT1-EH-EH-NN1-TT1.

One EH is used in the first syllable, which is unstressed, and two EHs are used in the second syllable, which is stressed.

When using allophone mode, always think how a word sounds, not how it is spelled. For example the NG allophone obviously belongs

at the end of the words 'sing' and 'long', but notice that the NG sound is also represented by the letter 'n' in the word 'uncle'! Some sounds may not be represented in words by any letters, such as the YY1 sound in 'computer':

KK1-AX-MM-PP1-YY1-UW1-TT2-ER.

Also, if after several attempts the required word still doesn't sound right, it may be so because of an incorrect stress (doubling or even tripling of a short vowel will fix the problem) or a missing pause before a consonant. Some sounds (PP, BB, TT, DD, KK, CH and JH) require a brief duration of silence preceding them. For most of these, the silence is already included in the allophone, but more may be added as desired. That's why there are short pauses PA1 and PA2 in the allophone set. The effect of an added pause is sometimes dramatic. Often even a pause before a vowel, especially when using EasyFlexion, can help to finely 'tune' the pronunciation of a word - see the end of chapter 6 in this section how we constructed the power-on greeting 'hello'.

## 4. Using Allophones

To output allophones to EasyTalker, send the !A command, followed by the allophones you wish to be pronounced, separated by hyphens. The allophone mode is cancelled by the first space character encountered or by carriage return. It is also possible to combine allophone mode together with text-to-speech conversion mode. For instance a line like this,

hello !A-Hh1-Eh-L1-0w hello  
when output to EasyTalker, will cause the word 'hello' to be pronounced three times.

Notice that we separated the command !A from the subsequent allophone by a hyphen, for a better readability. However, this is not necessary:

!AHh1-Eh-L1-0w  
is also possible.

Unknown allophone codes, when encountered within a string of allophones, are disregarded.

## 5. Setting Volume

Volume in the allophone mode can be set in the same way as in the text-to-speech conversion mode.

Naturally, it is possible to set a different volume for each allophone separately, which again makes it possible to finely adjust the speech pronunciation. The volume can be set using the !V command.

Example:

```
!A-!V0-Hh1-Eh-!V7-L1-Ow
```

The 'he' of 'hello' is pronounced at the softest level. The final part of the word is pronounced at the maximum volume level.

Note: Upon power on, the volume is set automatically at level 5.

## 6. Using EasyFlexion

To indicate inflection in the allophone mode, we have chosen a totally different approach which, in our opinion, makes an allophone text with inflection much easier to read. Because each allophone code, as used internally in EasyTalker, carries also the EasyFlexion information, we found it only logical to design a way of notation from which it would be

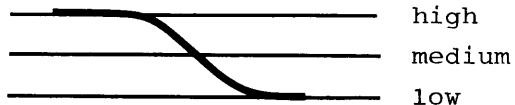
immediately apparent how a particular allophone is 'inflected'.

Let's mark all 'low-pitched' allophones with lower case characters, such as 'hh1', 'eh', etc. Upper case characters will denote 'high-pitched' allophones, such as 'HH1', 'EH', etc. A mixture of upper and lower case indicates medium inflection level, e.g. 'Hh1', 'Eh', etc. ('hH1' or 'eH' are also valid and recognized.)

It must be borne in mind, however, that this form of notation is just a convenient approximation. EasyFlexion is a dynamic process, a 'sliding' action, also having a time constant which causes a certain delay after the allophone representation, which again varies depending upon the type of the particular allophone.

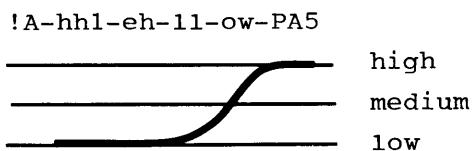
Example:

```
!A-HH1-EH-L1-ow-pa5
```



Also note that an allophone still sounds when a next allophone is entered and its inflection information is processed. Therefore,

it is necessary to distinguish between low-, medium- and high-pitched pauses, such as pa5, Pa5 and PA5. To alter the pitch of the voice at the end of a word it is usually sufficient to use just an 'inflected pause', as in the following example:



The combination of allophone mode and EasyFlexion can bring about dramatic improvement in the quality of the generated speech and can render the speech a unique character. For example, here is the allophone representation of the 'hello' which EasyTalker says upon power on:

HH1-PA1-EH-LL-Pa1-ao-ao-ao-uh-pa5

Notice that we chose to use a sequence of three A0 allophones with an UH, rather than the obvious but less flexible OW as in Hh1-Eh-Ll-Ow. The two PA1 pauses also help to finely adjust the sound of the word.

## V. LAUGHTER

The allophone set of EasyTalker is sufficiently flexible to enable the construction of even some non-speech sounds, such as laughter, cough, etc. Indeed, EasyTalker is the first speech synthesizer in the world which offers laughter as a standard feature.

There are four types of 'standard' laughter, invoked by the following self-explanatory commands:

!LAUGH  
!TITTER  
!GIGGLE  
!CHUCKLE

The commands may be included even within a sentence, such as in the following example:

Mary !giggle do you remember?

EasyFlexion has no effect upon the laughter commands: they already use a pre-defined inflection pattern for optimum quality of the generated laughter.

# VI.USING EASYTALKER IN FOREIGN LANGUAGES

Although having been designed primarily for English, EasyTalker can also be used with the majority of other languages. The allophone set is flexible enough to cover most human-generated sounds. In almost every language the allophone mode can be used without problems or even with fewer problems than in English. This is because the majority of languages are more phonetic than English.

Here are just a few examples:

## 1. Arabic



Sh-Aa-Mm-Ss-Uh-Nn1

## 2. Chinese (mandarin)



Ww-ao-ao-pa3-AY-PA3-nn1-iy-pa5

## 3. Czech

Ahoj.

Aa-Hh1-Oy

## 4. French

Je t'aime.

Zh-Ax-Pa4-Tt2-Eh-Eh-Mm

## 5. German

Danke schön.

Dd2-Aa-Ng-Kk1-Eh1-Sh-Ax-Ax-Ax-Nn1

## 6. Italian

Arrivederci.

Aa-Rr2-Ih-Vv-Eh-Dd1-Eh-Rr2-Ch-Ih

## 7. Spanish

Por favor.

Pp-Or-Pa2-Ff-Aa-Bb2-Ao-Or

## Note:

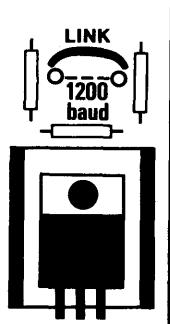
In most languages, the inflection is not essential for the meaning of a word. However, this is not true about Chinese. Here an incorrect inflection can totally change the meaning. For this reason, EasyFlexion is the only method which makes the Chinese language feasible in speech synthesizers. Consequently, EasyTalker is currently the only commercially available speech synthesizer in the world which is capable of generating Chinese speech.

## VII.CHANGING BAUD RATE

The baud rate of EasyTalker's serial interface is normally 300 baud. It can be changed to 1200 baud using a solder link on the printed circuit board.

Before dismantling the EasyTalker's enclosure please make sure that the power connector is unplugged from the power socket.

Remove the two screws from the base of EasyTalker. Remove the upper part of the enclosure. The solder link should be placed over the position on the printed circuit board marked '1200 baud'.



Please proceed carefully - the manufacturer can not be held responsible for any damages caused by the link being placed other than where indicated.

## VIII.A NOTE FOR INDUSTRIAL USERS

The EasyTalker board is also available as a building block for machines, industrial robots, scientific instruments and other equipment. Its low cost and outstanding quality of speech, unmatched by other voice synthesizers in the unlimited vocabulary group, determine EasyTalker as the prime choice whenever spoken output of data is needed.

For instance, it is a well known fact that a spoken alarm is much more efficient than a flashing red light on an instrument panel. Also, spoken data transmissions for remote data monitoring can be often a far better choice than usual modem links - the data can be retrieved immediately, without the need of a modem and terminal.

Alarm outputs for data logging can be made much more flexible and efficient. Indeed, most data loggers allow the programming of alarm messages to be output whenever a limit value has been exceeded or an event occurs. In these cases the connecting of EasyTalker is straightforward and requires no extra hardware or software.

The possibilities are unlimited and the cost-effectiveness of EasyTalker makes it feasible to introduce a fresh new approach to many industrial and scientific projects in most areas.

For original equipment manufacturers, the EasyTalker board is available in two basic versions:

#### 9V version

This version is identical to that which is part of the EasyTalker stand-alone unit. The board comes with standard RS-232 interface and is powered by a 9V unregulated DC power supply as per specifications in chapter IX.

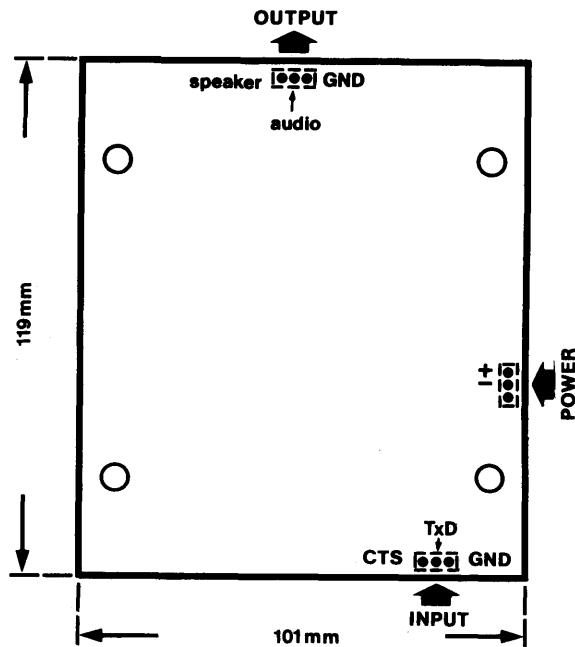
#### 5V version

This version is to be powered from a 5V regulated DC power supply, the power consumption being less than 2W.

The only other difference from the 9V version is the input interface, which uses TTL levels rather than RS-232. The logical polarity of the signals is, however, identical to that of the RS-232: The TxD (data transmitted from computer) is expected inverted, i.e.

'mark' is logical zero. The CTS signal (clear to send) is active 'high' and when asserted, indicates that the computer is allowed to send data to EasyTalker.

All the external connections are marked by silk-screening on the EasyTalker board, however, we include a diagram here for your reference:



As for EasyTalker software, this can be modified to suit your individual requirements. Text-to-speech conversion algorithms for several languages other than English are available and others may be developed on request.

# IX.TECHNICAL SPECIFICATIONS

## NOTES

Supply voltage: 9V DC, unregulated  
Supply current: 450 mA max  
Interface type: RS-232C, CTS/RTS  
                  handshake  
Baud rate:      300 baud (see also  
                  chapter VII)  
Format:          8 bit, no parity,  
                  1 stop bit  
Buffer length:  128 characters  
Audio output:   100mV p-p/20kohm  
Speaker output: 0.25W min/8ohms  
Speaker:         0.25W/8ohms  
Dimensions:     5'' x 1.5'' x 5''

Interface socket pinout:

pin	function	source
2	TxD (transmitted data)	computer
5	CTS (clear to send)	EasyTalker
6	DSR (data set ready)	EasyTalker (permanently asserted)
7	GND (ground)	

